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AN EXAMINATION OF THE RELATIONSHIP BETWEEN BANKING SECTOR PROFITABILITY AND ECONOMIC POLICY UNCERTAINTY USING PANEL DATA ANALYSIS[1]

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ABSTRACT

This study investigates the impact of increased economic policy uncertainty following the 2008 global financial crisis on the profitability of the banking industry. The study employs the panel data analysis technique, encompassing a sample of 25 nations and a time period spanning from 2008 to 2021. In the study, the Economic Policy Uncertainty (EPU) index developed by Baker, Bloom and Davis (2015) was used as the main independent variable, while net interest margin (NIM), return on assets (ROA) and return on equity (ROE) were considered as indicators of bank profitability. In addition, the World Uncertainty Index (WUI) and Credit Default Swap (CDS) were included in the model as control variables. Methodologically, Westerlund cointegration test, Mean Group (MG) and Fully Modified Ordinary Least Square (FMOLS) estimators were used. The analysis results reveal that there is a long-term and significant relationship between EPU and bank profitability indicators. The findings show that the increase in economic policy uncertainty generally negatively affects bank profitability. In particular, increases in EPU are found to have a statistically significant and negative effect on ROA and ROE. This work contributes to the literature on understanding the effects of economic policy uncertainty on the financial system, with crucial implications for policymakers. The results highlight the importance of reducing economic policy uncertainty for financial stability and suggest new perspectives for future research.

Keywords: Uncertainty, Economic Policy Uncertainty, Bank Profitability, Panel Data Analysis, Cointegration

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BANKACILIK SEKTÖRÜNÜN KARLILIĞI VE EKONOMİK POLİTİKA BELİRSİZLİĞİ İLİŞKİSİNİN PANEL VERİ ANALİZİ İLE İNCELENMESİ

ÖZET

Bu çalışma, 2008 küresel finansal krizi sonrasında artan ekonomik politika belirsizliğinin bankacılık sektörünün karlılığı üzerindeki etkilerini incelemektedir. Araştırma, 25 ülkeyi kapsayan ve 2008-2021 yılları arasındaki dönemi içeren panel veri analizi yöntemini kullanmaktadır. Çalışmada, Baker, Bloom ve Davis (2015) tarafından geliştirilen Ekonomik Politika Belirsizliği (EPU) endeksi temel bağımsız değişken olarak kullanılırken, banka karlılığının göstergeleri olarak net faiz marjı (NIM), aktif karlılık (ROA) ve özkaynak karlılığı (ROE) ele alınmıştır. Ayrıca, Dünya Belirsizlik Endeksi (WUI) ve Kredi Temerrüt Takası (CDS) kontrol değişkenleri olarak modele dâhil edilmiştir. Metodolojik olarak, Pedroni eşbütünleşme testi, Mean Group (MG) ve Fully Modified Ordinary Least Square (FMOLS) tahmincileri kullanılmıştır. Analiz sonuçları, EPU ile banka karlılık göstergeleri arasında uzun dönemli ve anlamlı bir ilişki olduğunu ortaya koymaktadır. Bulgular, ekonomik politika belirsizliğindeki artışın banka karlılığını genel olarak negatif etkilediğini göstermektedir. Özellikle, EPU'daki artışların ROA ve ROE üzerinde istatistiksel olarak anlamlı ve negatif bir etkisi olduğu tespit edilmiştir. Bu çalışma, ekonomik politika belirsizliğinin finansal sistem üzerindeki etkilerini anlamaya yönelik literatüre katkı sağlamakta ve politika yapıcılar için önemli çıkarımlar sunmaktadır. Sonuçlar, ekonomik politika belirsizliğinin azaltılmasının finansal istikrar için önemini vurgulamakta ve gelecekteki araştırmalar için yeni perspektifler önermektedir.

Anahtar Kelimeler: Belirsizlik, Ekonomik Politika Belirsizliği, Banka Karlılığı, Panel Veri Analizi, Eş Bütünleşme

1. INTRODUCTION

Uncertainty is a key aspect of the economy and has played a significant role in the development of economics as a scientific discipline. This interest, which began with thinkers such as Cantillon, Condillac and Smith in the 18th century, deepened in the 20th century with the work of economists such as Knight, Keynes and Hutchison. These thinkers tried to determine the place of the concept of uncertainty in economics and to analyze it.

However, to this day, there is still no universally agreed-upon definition for the concept of economic uncertainty. The main reason for this situation is the methodological difficulties in scientifically measuring uncertainty. This difficulty has led to uncertainty generally being addressed within the framework of the concept of risk. However, developments in recent years have shown that uncertainty has become an unignorable phenomenon in the social and political context.

Indeed, the recent global financial crisis has clearly demonstrated that policy uncertainties negatively affect the decision-making processes of all actors in the economy, including households, companies, banks, financial markets, as well as policy makers (Haddow et al., 2013). In this context, the importance of investigating uncertainty and its effects on economic dynamics is increasing.

Although the difficulty of including uncertainty in analyses and measuring it continues, it has become possible to include it in calculations and conduct analyses by using proxy variables in current approaches. As stated by Carney (2016), uncertainty can be managed more effectively in the period after the initial shock with some necessary complex and time-consuming regulatory policy steps. The 2008 Global Financial Crisis has significantly increased academic interest in the concept of policy uncertainty. It is widely accepted that economic policy uncertainty plays a critical role both in the crisis process and in the economic recovery period (Baker, Bloom, & Davis, 2016). In this context, it is observed that research focusing on uncertainty and its economic effects has intensified during and after the crisis period. In this direction, the study investigates the effects of economic policy uncertainties on the profitability of the banking sector.

The primary aim of this study is to examine the extent to which the banking sector in 25 countries, including Turkiye, was impacted by uncertainty in economic policies from 2008 to 2021. In the study NIM, ROA and ROE are used as indicators of bank profitability. While the EPU data is considered as the main independent variable, the WUI and CDS are included in the analysis as control variables. The effect of EPU and other uncertainty indicators on bank profitability variables will be examined using the Mean Group and Fully Modified Ordinary Least Square methods. The study consists of 5 sections. In the second section, a comprehensive evaluation of the existing literature examining the relationship between economic policy uncertainty and bank profitability will be presented. In the third section, an economic policy uncertainty index specific to Turkiye will be created. In the fourth section, the dataset used in the study will be introduced, the characteristics of the variables will be analyzed and the applied econometric methods will be explained in detail. In the last section, the main findings of the study will be summarized, policy recommendations will be presented and suggestions for future research will be developed.

2. LITERATURE

This study is situated at the convergence of two bodies of literature and seeks to make a meaningful contribution to both areas. It addresses the methodological and theoretical foundations of the economic policy uncertainty index and the reflections of this uncertainty on the profitability dynamics of the banking sector with an integrative approach.

Following the 2008 global financial crisis, the notion of economic policy uncertainty has been a significant topic in academic research, particularly through the works of Baker, Bloom, and Davis in 2012, 2013, and 2016. These studies have developed an innovative index to measure economic policy uncertainty. The studies of Baker, Bloom and Davis have formed the methodological basis of the EPU index. The "Newspaper-Based Guide to Economic Policy Uncertainty" published in 2015 has set a standard for subsequent research in this field (Baker, Bloom, & Davis, 2015). The pioneering EPU index developed by Baker, Bloom and Davis for the USA has shown significant increases throughout various historical events and periods. Extending their methodology, Baker, Bloom and Davis also construct EPU indices for Germany, Italy, France, Spain and the United Kingdom. They develop both separate country-based indices and an aggregated European EPU index for these countries. The reliability and representativeness of the dataset is increased by searching at least two leading newspapers for each country.

The Belgian EPU index created by Algaba et al. (2020) covering the years 2000-2021 and using data from eight newspapers has seen an increase during election periods, the Global Financial Crisis, government regulations and especially the Covid-19 period. Cerda et al. (2016) created an EPU index for Chile covering two Chilean newspapers starting from 1993. The index increased significantly during the Asian crisis, the Dot-Com Bubble, the 2nd Gulf War, tax regulation and especially the period when labor reform was implemented. The study conducted by BBD and Wang (2016) based on a national newspaper for China covers the years 1995-2011 and the Asian Crisis, the US Operation in Afghanistan, SARS and the Iraq War, the 2008 crisis and the inflationary pressure experienced, and the European Debt Crisis were found to be periods when economic policy uncertainty was high. In their study, Bergman et al. (2021) found that EPU was high during the Banking Crisis, IT Bubble, Financial Crisis, European Debt Crisis, Brexit and Covid-19 pandemic periods, according to the index they created for Denmark based on five newspapers across the country between 1991 and 2021. In the study conducted by Fountas et al. (2018) for Greece and covering the years 1998-2018, a national newspaper was used. According to the findings, it was found that EPU was high in Greece during the Russian Crisis, September 11 Attack, Gulf War II, Financial Crisis, general elections and US presidential election (Donald Trump). The index created by Arbatli et al. (2022) for Japan consists of data obtained from four major newspapers and covers the period 1987-2015. According to the results of the study, it was concluded that EPU was high during the Asian Crisis, Russian Crisis, general elections, Global Financial Crisis, European Debt Crisis and the bill to increase consumption tax. Armelius et al. (2017) obtained an EPU index by scanning four national newspapers for Sweden between the years 1976-2016. The findings of the study show that it increased during the devaluation, OPEC decision to reduce oil production, new government elections, Global Financial Crisis, Greece bailout and Brexit discussions. Choudhary et al. 2020, by scanning four national newspapers for Pakistan, created an index covering the years 2010-2020. In these years, it was found that EPU was high during the PTI Dharna freedom march, in 2017 when the stock market was extremely volatile and during the Covid-19 pandemic period. Zalla (2016) also created an EPU index for Ireland based on a national newspaper for the years 1985-2016. It was found that it increased especially during Brexit, the 2008 crisis, the 1999 Eurozone transformation, political elections and terrorist acts.

Gwang (2022) examined the profitability structures of 135 Chinese commercial banks based on the EPU index prepared by Baker et al. (2016) between 2007 and 2019. According to the results of the study using Multiple Linear Regression, 2SLS, and Systematic GMM methods, they found that when EPU was high, commercial banks reduced credit supply, increased credit concentration, and shifted to medium/long-term loans. In his study, Athari (2021) investigated the effects of global economic policy uncertainties (GEPU) on the profitability of the Ukrainian banking sector for the years 2005-2015 using OLS and PCSE methods. The results show that local political stability and global economic policy uncertainty have significant positive and negative effects on the profitability of Ukrainian banks, respectively. In their study in 2022, Tian et al. investigated the relationship between economic policy uncertainties, bank loans and corporate innovation using endogeneity tests and placebo management for the Chinese sample in the years 2008-2018. The study found a negative relationship between EPU and bank profitability. At the same time, a negative relationship was found between institutional innovation and EPU, but according to the findings of the study, this relationship cannot be attributed to credit crunch. It is stated that bank loans can support institutional innovation in periods of high uncertainty. In the study where EPU data of 18 countries were used for the years 1985-2013 using the GMM method, Xu and Çağlayan (2019) investigated credit volume, non-performing transfer rates and credit provision ratios. In the study, significant evidence was obtained that EPU reduced credit utilization, caused an increase in non-performing loans and loan loss provisions, and disrupted the stability of the banking sector. Duan et al. (2022) applied regression analysis on 889 banks listed on the stock exchanges of EPU in 29 countries in the period 2000-2022. In their studies where they used the OLS method, evidence was observed that the effect of banks on systemic risk increased in periods when economic policy uncertainties increased. In addition, one of the important findings of the study is that uncertainties in developed countries tend to significantly spread and affect developing countries. Boungou and Mavusi (2022) investigated how banks adjust their business models in an environment of increasing global uncertainty. Specifically, the effect of EPU on non-interest income was analyzed by analyzing the data of 3913 banks operating in 9 countries. The panel data method was used in the study investigating the years 2009-2018. As a result, it was found that EPU did not affect net non-interest income. In further analysis, it was stated that the reason for this was due to non-interest expenses. In addition, it was determined that the income diversification probability of banks in a high EPU environment largely depends on the interest rate. In the study of Nguyen (2021), economic policy uncertainty is examined through the effects on the stability of the banking sector and the relationship between regulation and supervision. The study covers the period 2005-2020 and the GMM method is used. In the study conducted with data from more than 950 commercial banks in 8 major European countries, it was concluded that the increase in increasing economic policy uncertainties has a strong relationship with the decrease in bank stability under conditions where other variables are considered constant. The study evaluated that strengthening regulatory and supervisory activities will increase the stability of the banking sector and reduce the impact of uncertainties. Ozili and Arun (2022) investigated net interest margin, loan-deposit difference, non-interest income ratio, post-tax asset return and pre-tax equity return with EPU in their study on 22 developed countries. Real GDP growth rate, bad loans and regulatory capital ratio are negatively related to profitability in high EPU periods. The study also found that EPU may positively affect profitability due to regional differences in some regions of America and Asia. Dasalegn and Zhu (2021) found in their study that earnings opacity decreased in Chinese banks during periods when EPU was high. Berger et al. (2022) found in their study that banks tend to increase liquidity when EPU increases.

3. ECONOMIC POLICY UNCERTAINTY INDEX

The data utilized in the EPU index is gathered through the process of textual analysis of articles in newspapers. Information about the index and the guide on the method are published on the Economic Policy Uncertainty Index website. The "Newspaper-Based Economic Policy Uncertainty Guide" published by Baker, Bloom and Davis (2015) was published to ensure that studies in this field are carried out in accordance with similar rules. This guide aims to standardize critical methodological elements such as newspaper scanning methods, keyword selection, data collection and processing procedures to be used in the creation of the EPU index.

In this study conducted to create the Economic Policy Uncertainty (EPU) index for Turkiye, three national newspapers were selected. One of them is focused on the economy, and the other two are daily political newspapers. In the selection of newspapers, criteria such as high circulation, deep-rooted history and accessibility to digital archives were taken into consideration.

The research covers the years 2002-2022. Due to data limitations, data from the economy newspaper could only be included for the period after June 2013.

The data collection process was carried out using the text mining method, which includes three basic word combinations. A total of 28 combinations were scanned, consisting of the words "uncertain", "uncertainty" representing uncertainty, "economy", "economic" representing the economy, and "political", "budget", "tax", "central bank", "parliament", "law", "financial" representing the concept of policy.

The methodology in the "Newspaper-Based Economic Policy Uncertainty Guide" published by Baker, Bloom, and Davis (2015) was followed in the creation of the Turkiye Economic Policy Uncertainty (TEPU) index. The index creation process includes the following steps:

1. The raw data of the number of articles/columns/news articles that meet the specified criteria were collected.

2. The number of articles/columns/news articles obtained was compared to the total monthly number of articles/columns/news articles of the relevant newspapers, and the frequency of the average number was calculated.

3. The number of articles/columns/news articles of each newspaper was standardized according to the standard deviation and mean for the period 2002-2022.

4. The standardized data were combined by taking monthly averages.

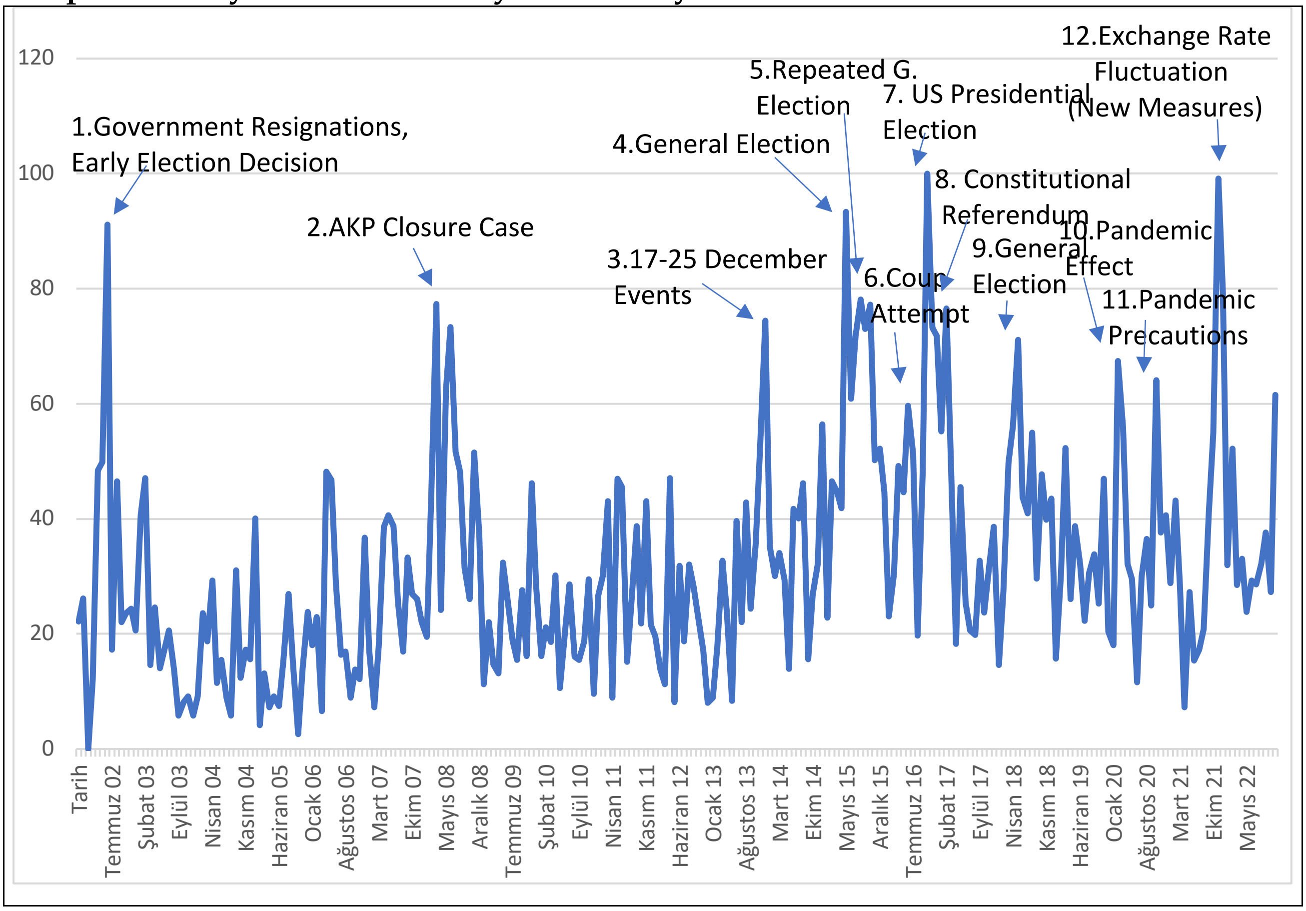
5. Finally, the data were normalized and scaled to be evaluated out of 100.

This methodological approach ensures that the TEPU index is created in accordance with international standards and is comparable to the EPU indices of other countries.

In addition, this method allows measuring and analyzing the change in economic policy uncertainty in Turkiye over time.

Graph 1 shows the time series graph of the TEPU index developed for Turkiye.

Graph 1. Turkiye Economic Policy Uncertainty Index



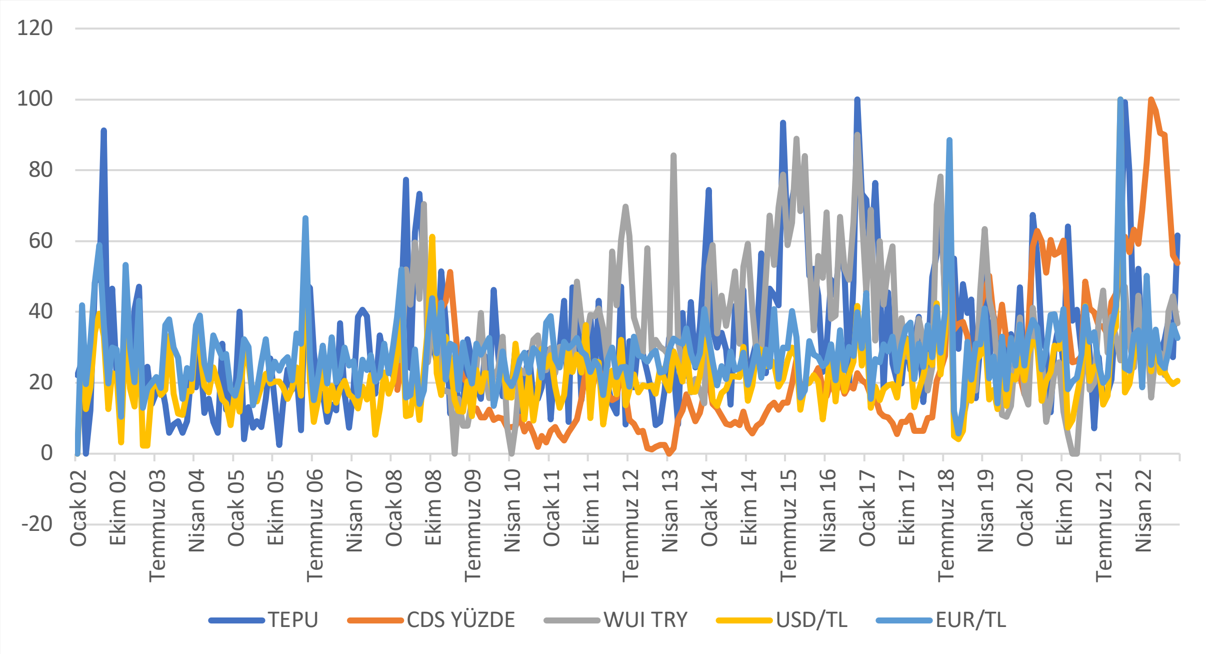
According to the index, the years and events with high fluctuations in the monthly index covering January 2002-December 2022 are as follows in chronological order.

Table 1. Chronological Order of Important Events Observed at Turkiye Economic Policy Uncertainty (TEPU) Index Peaks

No	Date	Event
1	July 2002	The decision to hold early elections following the health problems of the Prime Minister and the cabinet resignations
2	March 2008	The Chief Public Prosecutor's application to the Constitutional Court to request the closure of the ruling party
3	December 2013-January 2014	17-25 December corruption and bribery investigations and the rejection of the request to refer some ministers to the Supreme Court by the Turkish Grand National Assembly
4	June 2015	In the June 7 general elections, no single party was able to form a majority and coalition talks were unsuccessful.
5	November 2015	Following the failure of the government formation process after June 7, a new election was held on November 1.
6	July 2016	July 15 coup attempt
7	November 2016	Republican candidate Donald Trump wins US Presidential elections
8	March 2017	Discussions on the transition to the presidential system and the referendum on constitutional amendments
9	June 2018	Presidential and parliamentary general elections.
10	March 2020	COVID-19 cases started to appear in Turkiye and education was suspended in educational institutions.
11	November 2020	Implementation of new measures and curfews as part of the fight against the COVID-19 pandemic
12	December 2021	Excessive fluctuations in exchange rates and the announcement of a new economic measures package

Note: Table 1 shows the important events observed during the periods when the Turkiye Economic Policy Uncertainty Index peaked in chronological order.

Graph 2. Turkiye Economic Policy Uncertainty Index and Its Relationship with Variables



Graph 2 shows the relationship between the TEPU Index and various macroeconomic variables. According to the analysis results, positive correlations were found between the TEPU Index and other variables examined.

Specifically, correlations of 0.44 were observed between TEPU Index and WUITRY (World Uncertainty Index for Turkiye), 0.37 between TEPU and EUREPU (European Economic Policy Uncertainty Index), and 0.31 between TEPU and GEPU (Global Economic Policy Uncertainty Index).

A correlation of 0.15 was observed between Credit Default Swap and TEPU Index created within the scope of the study. However, graphical analysis suggests that there may be a stronger relationship between CDS and TEPU Index with a lag. This finding indicates that the dynamic interaction between the two variables should be examined in more detail.

4. DATA SET AND METHODOLOGY

4.1. Econometric Method and Analysis of Series Used

Panel data analysis involves examining data sets created by bringing together observations from different units (e.g. households, countries or firms) over specific time periods (Baltagi, 2005). The main advantage of this method is the flexibility it provides in modelling heterogeneity between units (Greene, 2003). Panel data offers significant advantages in revealing the changes and dynamic behaviors of units over time (Çınar, 2021). Panel data series is shown with two subscripts that can be expressed as y_(i,t). Here, the differences between units are taken into account with i= 1,2,3…..N and the time dimension is taken into account with t=1,2,3….T (Hsiao, 2005). In essence, panel data is both time and unit dimensional.

In this study, the relationship between bank performance indicators (return on assets, return on equity and net interest margin) and Economic Policy Uncertainty was examined. World Uncertainty Index and Credit Default Swap were included in the model as control variables. The research model is expressed by the following equations:

$$NIM_{i,t} = \beta_0 + \beta_1 lnCDS_{i,t} + \beta_2 InEPU_{i,t} + \beta_3 lnWUI_{i,t} + \varepsilon_{i,t} \quad (1)$$

$$ROA_{i,t} = \beta_0 + \beta_1 lnCDS_{i,t} + \beta_2 InEPU_{i,t} + \beta_3 lnWUI_{i,t} + \varepsilon_{i,t} \quad (2)$$

$$ROE_{i,t} = \beta_0 + \beta_1 lnCDS_{i,t} + \beta_2 InEPU_{i,t} + \beta_3 lnWUI_{i,t} + \varepsilon_{i,t} \quad (3)$$

The main hypotheses of the study developed according to the research model are as follows.

Hip.1: There is no significant relationship between economic policy uncertainty and net interest margin.

Hip.2: There is no significant relationship between economic policy uncertainty and active profitability.

Hip.3: There is no significant relationship between economic policy uncertainty and equity profitability.

Table 2. Variables and Data Sources

Variable Type	Abbreviation	Description	Data Source
Dependent Variables	NIM	Net Interest Margin	World Bank (WB-Global Financial Development Database)
	ROA	Bank Return on Assets	World Bank (WB-Global Financial Development Database)
	ROE	Bank Return on Equity	World Bank (WB-Global Financial Development Database)
Independent Variables	EPU	Economic Policy Uncertainty Index	Economic Policy Uncertainty Index (policyuncertainty.com)
	WUI	World Uncertainty Index	World Uncertainty Index (worlduncertaintyindex.com)
	CDS	Credit Risk Premium	Compiled from Investing.com and Reuters Terminal

Note: EPU index for Turkiye is prepared by us.

The sample of the study was composed of countries for which EPU was calculated on the Economic Policy Uncertainty Index (policyuncertainty.com). These countries include the USA, Belgium, Brazil, Canada, Chile, China, Colombia, Croatia, Denmark, France, Germany, Greece, Hong Kong, Ireland, Italy, Japan, South Korea, Mexico, the Netherlands, Russia, Singapore, Spain, the United Kingdom, and Sweden. Australia, Nigeria, Pakistan, New Zealand, and India were excluded from the study due to insufficient data for the period between 2008 and 2021. Turkiye was included in the study with the TEPU index prepared by the researchers based on the "Newspaper-Based Economic Policy Uncertainty Guide".

The starting year of the dataset is 2008. The reason for this selection is that CDS data is only available after this date. ROA, ROE and NIM variables are calculated annually, and the latest data available for the relevant countries belongs to the year 2021.

In order to minimize potential distortions in the variables and to normalize the data, natural logarithms of all variables were computed during the data processing procedure. Since ROA, ROE and NIM are annual data, EPU, WUI and CDS variables were also converted to annual data by taking their weighted averages.

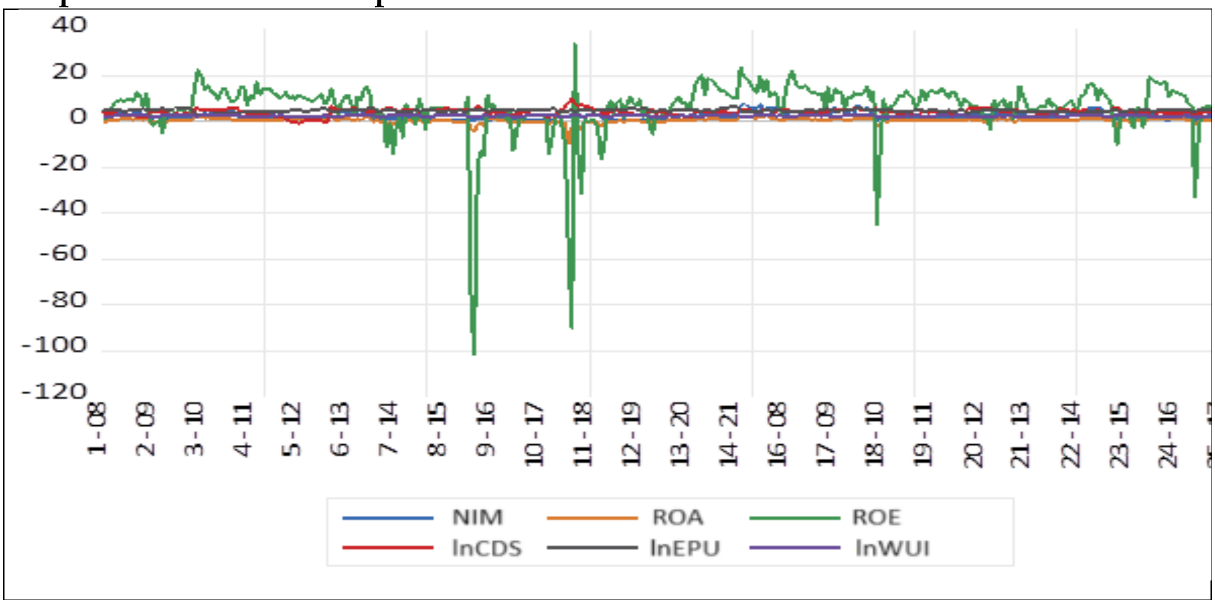
Table 3: Descriptive Statistics

	NIM	ROA	ROE	LNCDS	LNEPU	LNWUI
Mean	2.372363	0.588047	6.408379	4.202324	4.870543	2.578832
Median	1.712891	0.655404	8.542123	4.306840	4.859389	2.556412
Maximum	7.933610	2.561428	34.05960	10.02030	6.674561	3.356374
Minimum	0.125580	-9.530661	-102.1465	-0.776529	3.022082	2.033528
Std. Dev.	1.590926	0.963910	12.45097	1.370504	0.546681	0.251851
Skewness	1.095755	-4.277868	-4.736240	-0.576512	-0.383671	0.291962
Kurtosis	3.488662	39.96577	35.32997	5.313626	4.938106	2.456599
Jarque-Bera	73.52192	20995.17	16551.42	97.45065	63.36558	9.278662
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.009664
Sum	830.3271	205.8165	2242.933	1470.814	1704.690	902.5912
Sum Sq. Dev.	883.3344	324.2636	54104.34	655.5199	104.3023	22.13674

Observations	350	350	350	350	350	350

When descriptive statistics are examined, it is determined that the mean value of the ROE indicator is 6.41 and the median value is 8.54. These values indicate that the return on equity of banks is higher than ROA (0.59) and NIM (2.37) indicators. When evaluated in terms of variability, it is observed that the ROE series has the highest standard deviation (12.45), whereas the lnWUI series exhibits the lowest standard deviation (0.25). When the distribution properties are examined, it is determined that the NIM and lnWUI series have positive skewness (skewed to the right), while the other series have negative skewness (skewed to the left). In terms of kurtosis, it is determined that the lnWUI series exhibits a platykurtic (flat) distribution, while the other series exhibit leptokurtic (pointed) distribution and have a thick tail structure. According to the normality test results, it was observed that the Jarque-Bera probability values for all series remained below the 0.05 significance level. This finding leads to the rejection of the hypothesis that the series are normally distributed and to the acceptance that they do not conform to a normal distribution.

Graph 3: Time Series Graph of Variables



Graph 3, visually illustrates the changes that the variables under investigation have revealed over the course of the time series. In light of the observed data, it has been determined that the return on equity ROE indicator exhibits significantly higher volatility compared to other variables, as stated in previous analyses. This high volatility in the ROE series indicates that financial performance varies significantly over time. The movements of other indicators over time exhibit less amplitude and higher stationarity compared to ROE.

Table 4: Correlation Matrix

Correlation	ROE	lnCDS	lnEPU	lnWUI
ROE	1.000000			
lnCDS	-0.253070	1.000000		
lnEPU	-0.137831	-0.226576	1.000000	
lnWUI	0.072098	-0.013222	0.299923	1.000000

It shows that the relationships between ROE indicator and uncertainty measures are different. This unexpected relationship suggests that the impact of global uncertainty factors on local bank performance may be more complex and potentially affected by other economic or financial factors.

In the study investigating the relationship between banking sector profitability variables and economic policy uncertainties, Westerlund Cointegration, MG and Fully FMOLS and methods and Dumitrescu Hurlin Granger Causality Test were used. In order to select the correct and consistent methods and not to be exposed to spurious regression, variables should be tested with assumptions. In the study, assumptions of cross-sectional dependence, stationarity and cointegration were tested.

According to Westerlund ve Edgerton (2007) the following model can be given.

$$Y_{i,t} = Z'_{i,t}\delta_i + X'_{i,t}\,\beta_i + \varepsilon_{i,t} \qquad E\left(\varepsilon_{i,t}, f, \varepsilon_{j,t},\right) = 0$$

Pesaran and Smith's (1995) MG estimation method, which provides heterogeneity in the panel, was used. The MG estimation is based on the following equation.

δMG=N-1Σδ_i N_i i=1

Here δMG is the mean group coefficient and δ̂ i is the ordinary least squares (OLS) estimate of each section. This method is obtained by using an error correction model in which the short-term dynamics of the series are affected by the long-term deviations and can be expressed as follows.

$$\Delta y_t = \phi(y_{t-1} - g' X_{t-1}) + \sum_{j=1}^{p-1} \lambda_j \Delta y_{t-j} + \sum_{j=0}^{q-1} \delta_j' \Delta X_{t-j} + \mu_t + \epsilon_t$$

Fully Modified Least Squares was developed by Philips and Hansen (1990) to implement an optimal cointegration regression estimation. However, Pedroni (2001) FMOLS estimator was used for panel cointegration regression in the study. This estimator provides advantages in correcting the endogeneity problem and serial correlation. In addition, FMOLS is the most appropriate technique for panel data containing heterogeneous cointegration (Hamit-Haggar, 2012).

FMOLS estimation is based on the following basic equation.

$$a_{i,t} + \beta x_{i,t}' + \varepsilon_{i,t}$$

$$x_{i,t} = x_{i,t-1} + \varepsilon_{i,t}$$

Prior to conducting long-term analyses, it is necessary to ascertain whether the variables exhibit cross-sectional dependence in panel data analysis. If there is cross-sectional dependence, this situation is taken into account and unit root tests, long-term estimators, cointegration analysis and causality methods that are sensitive to cross-sectional dependence are preferred. Breusch-Pagan LM (1980), Pesaran scaled LM (2004) and Pesaran CD (2004) preferred in the study are preferred in studies with both homogeneous and heterogeneous data, while Bias-corrected scaled LM (2012) can be preferred in homogeneous distributed data. Determining the stationarity level of the series is important in choosing the appropriate estimator. Therefore, the stationarity level of the series should be checked in panel data analyses. In the study, the null hypothesis that the series is not stationary and contains a unit root was tested with the Extended Im, Pesaran and Shin (2003) unit root test. Cointegration analysis allows testing whether the series have a long-term relationship. Engle and Granger (1987) contributed to the development of cointegration tests by determining those linear combinations of non-stationary series can be stationary. If the error term is stationary, the Westerlund cointegration test (2001), which indicates that there is a long-term relationship between the variables, is frequently used in the literature.

4.2 Empirical Findings and Discussion

The cross-sectional dependency test results of the variables in the models used in the research are presented in Table 4.

Table 5: Cross-sectional Dependency Results

	Breusch-Pagan LM	**Pesaran scaled LM**	**Bias-corrected scaled LM**	**Pesaran CD**
NIM	975.6076*	27.58157*	26.62003*	9.896693*
ROA	570.9821*	11.06280*	10.10126*	4.067296*
ROE	587.0265*	11.71781*	10.75627*	2.123085**
lnCDS	1606.670*	53.34459*	52.38305*	24.06407*
lnEPU	900.1045*	24.49916*	23.53762*	20.56776*
lnWUI	2323.442*	82.60668*	81.64514*	46.59302*

''*'',''**',''***'' indicate significance at 1%, 5% and 10% levels, respectively.

It is seen that the probability values for all variables are significant at the 0.01 level. In this case, the null hypothesis $H0$: $co(uit, ujt) = \rho ij = 0$, which states that there is no correlation between the units of the residuals, is rejected. In other words, the hypothesis "*H0*: There is no cross-sectional dependence" can be rejected for all series. This result means that any uncertainty situation, shock or crisis occurring in one of the countries affects the other countries and affects the results of other countries, and ignoring this situation will cause erroneous measurements.

Table 6: Panel Unit Root Test Results

Model	**I(0)**	**I(1)**
Variables	**CIPS Testi**	**CIPS Testi**
NIM	-2.215	-3.901*
ROA	-2.773*	
ROE	-2.859*	
lnEPU	-2.080	-3.456*
lnWUI	-2.610*	
lnCDS	-2.507*	
Critical Values At	%1 -2.07 %5 -2.17 %10 -3.34	%1 -2.07 %5 -2.17 %10 -3.34

“ * ”,”**” and “***” indicate significance at 1%, 5% and 10% levels, respectively. Note: In the CIPS test, it is ‘’H0: The variable contains a unit root.’’

It is crucial to determine the stationarity level of the series in order to select the most appropriate estimator. Therefore, checking the stationarity level of the series is an important requirement in panel data analysis. The null hypothesis that the series is not stationary and contains a unit root was tested with the Extended Im, Pesaran and Shin (CIPS) unit root test in Table 5 above. According to the findings, while the NIM and LNEPU variables are stationary at the first difference at the 1% significance level, the other variables are stationary at the level. Therefore, the common integration order for all variables is I(1). In other words, all variables become stationary only at the first difference.

Table 7: Westerlund Cointegration Test Results

	Statitics	P-value	Result
Model 1	-1.7031	0.0491**	There is cointegration.
Model 2	-1.8601	0.0314**	There is cointegration.
Model 3	-1.7133	0.0433**	There is cointegration.

" * ", "**" and "***" indicate significance at 1%, 5% and 10% levels, respectively.

Table 7 shows the Westerlund cointegration results. Accordingly, the hypothesis ''H0: There is no cointegration between the series.'' is rejected and the alternative hypothesis is accepted since the p probability values are less than 0.05 according to all tests in all three models. There is a cointegration relationship in all three models and the variables move together in the long term. According to the findings obtained, it can be seen with the Westerlund Cointegration Test that there is a strong long-term relationship between the dependent variables and the independent variables. Therefore, the direction and effects of this relationship in the long term will be investigated with the MG and FMOLS methods, which are long-term estimators.

In this study, the Mean Group estimator developed by Pesaran and Smith (1995) was used as the application estimator. The MG estimator allows the constant term, error correction term and slope parameters in the econometric model to be heterogeneous across countries (Büberkökü, 2016). This method calculates the group parameter as the arithmetic mean of the estimators obtained for each country, while taking into account the heterogeneity of country-specific data. Thus, the MG estimator can effectively model differences between countries in panel data analysis.

Table 8: Mean Group Results Model 1

NIM						
Values	Coef.	Std.Err.	z	P>ǀzǀ	%95 Conf. Interval	
_ec						
LnEPU	.5108478	.6029542	0.85	0.317	-.6709208	1.692616
LnWUI	-2.608754	2.093705	-1.025	0.213	-6.712341	1.494833
LnCDS	-.7904373	.8625132	-0.92	0.359	-2.480932	.90000575
SR						
ec	-.6709999	.0710615	-9.44	0.000	-.9102779	-.5317219
LnEPU	-.0725856	.1408116	-0.52	0.606	-.3485712	.2034
LnWUI	-.2971929	.2593447	-1.15	0.252	-.8054992	.2111135
LnCDS	.0886866	.0700022	1.27	0.205	-.0485153	.2258885
_ cons	2.190968	.7366198	2.97	0.003	.74722	3.634716

" * ", "**" and "***" indicate significance at 1%, 5% and 10% levels, respectively.

The short-term analysis results are also provided by the MG method. The tables display the long-term and short-term results for the three models for which econometric studies were conducted using the MG method. In the short-term analysis, the value of the _ec, namely the error correction model term, should be in the range of 0<_ec<1. If the _ec value is between 0 and 1 and significant, it means that the error correction model term is working and the long-term results of the MG method are robust, and the deviations that occur in the short term are eliminated in the long term, and vice versa. According to the results of the study conducted for Model 1, the short-term error correction term was determined as -0.67. The probability value is also significant at the 1% level. This result obtained shows that the error correction model is working and the deviations that occur in the short term are eliminated in the long term. In the model where the net interest margin is considered as the dependent variable, the effect of LNEPU on NIM is positive, but this effect is not significant at the 0.05 level. The effects of the LNWUI and LNCDS variables are negative, and there is no significant effect for both variables.

Table 9: Mean Group Results Model 2

RAO						
Values	Coef.	Std.Err.	z	P>ǀzǀ	%95 Conf. Interval	
_ec						
LnEPU	-.4993498	.1761975	-2.83	0.005	-.8446905	-.1540091

	*					
LnWUI	.1326062	.3109822	0.43	0.670	-.4769077	.7421202
LnCDS	-.2529325 *	0.898414	-2.82	0.005	-.4290185	-.0768466
SR						
ec	-.8898907	.0546229	-16.29	0.0000	-.9969496	-.7828318
LnEPU	-.4219627	.1481779	-2.85	0.004	-.712386	-.1315393
LnWUI	.1359056	.2781346	0.49	0.625	-4092281	.6810393
LnCDS	-.2398348	.0794848	-3.02	0.003	-.3956222	-.080473
_ cons	3.313132	.5951105	5.57	0.000	2.146737	4.479527

“ * ”, “**” and “***” indicate significance at 1%, 5% and 10% levels, respectively.

According to the study results for Model 2, the short-term error correction term was determined as -0.89. The probability value is also significant at the 1% level. It was determined that when the LNEPU value increases by 1%, the ROA value decreases by 0.49% and when the LNCDS variable increases by 1%, the ROA variable is negatively affected at the 0.25% level, and this effect is significant for both variables according to the 1% probability value. The LNWUI variable has no significant effect.

Table 9: Mean Group Results Model 3

ROE						
Values	Coef.	Std.Err.	z	P>|z|	%95 Conf. Interval	
_ec						
LnEPU	-5.092574 **	2.10279	-2.42	0.015	-9.213966	-.9711823
LnWUI	4.260399	7.749518	0.55	0.582	-10.92838	19.44918
LnCDS	-1.839787 **	.7602337	-2.42	0.016	-3.329818	-3497564
SR						
ec	-.9462251	.0592803	-15.96	0.0000	-1.062412	-.8300378
LnEPU	-4.265816	1.703368	-2.50	0.012	-7.604356	-.927277
LnWUI	2.695102	5.861261	0.46	0.646	-8.792758	14.18296

LnCDS	-2.148776	.833653	-2.58	0.010	-3.782706	-.5148464
_ cons	31.37563	13.24465	2.37	0.018	5.416588	57.33466

" * ", "**" and "***" indicate significance at 1%, 5% and 10% levels, respectively.

The short-term error correction term is -0.95 and significant. A 1% increase in the LNEPU variable affects the ROE variable negatively at 5.09%. This effect is significant at 5%. A 1% increase in the LNCDS variable causes a 1.84% decrease in the ROE variable and this effect is reported to be significant. The coefficient expression indicating that the LNWUI variable and the ROE variable are positive has no significant effect according to the 10% probability level.

A substantial cointegration and long-term relationship can be observed in light of the findings of the aforementioned econometric study. The findings obtained with the MG method were also estimated with the FMOLS method, which is another long-term estimator. The FMOLS method is an effective method used in correcting deviations originating from situations that may create negativities such as autocorrelation and heteroscedasticity. In addition, the FMOLS method was preferred because it is an effective method in heterogeneous data distributions (Pedroni, 2000).

Table 10: FMOLS Long Term Results

	Variable	Coefficient	Std. Error	t-Statistic
Model 1	lnCDS	-0.409637*	0.007281	-56.25901
	lnEPU	-0.770478*	0.006927	-111.2293
	lnWUI	1.491601*	0.008622	173.0039
Model 2	lnCDS	-0.077766*	0.007281	-10.68027
	lnEPU	-0.400347*	0.006927	-57.79572
	lnWUI	1.100604*	0.008622	127.6540
Model 3	lnCDS	-2.098582*	0.007281	-288.2162
	lnEPU	-3.425285*	0.006927	-494.4876
	lnWUI	12.37400*	0.008622	1435.203

" * ", "**" and "***" indicate significance at 1%, 5% and 10% levels, respectively.

In Table 10, the long-term coefficients estimated with the FMOLS method, another long-term estimator other than MG, are included in the scope of the research.

The results show that the independent variables have a significant effect on NIM for Model 1. Accordingly, LNEPU has a significant and negative effect on NIM. Accordingly, when the value of LNEPU increases by 1%, the net interest margin decreases by approximately 0.77%. It is seen that the effect of LNCDS on NIM is negative and significant. In other words, a 1% increase in LNCDS decreases the NIM variable by 0.41%. In addition, when the values of LNWUI increase by 1%, NIM increases by 1.49%.

In Model 2, a significant effect was found at the 1% level between LNCDS and ROA variables. This effect is reflected as a 0.08% decrease in ROA when there is a 1% increase in LNCDS. A similar effect is also valid for the LNEPU variable. A 1% increase in the LNEPU variable decreases the ROA variable by 0.40%. An increase in the LNWUI variable causes a 1.10% increase in ROA. In addition, there is a significant effect at the 1% probability value for all three independent variables in the model.

In Model 3, where the effects of independent variables for the ROE variable are investigated, a 1% increase in LNCDS has a negative effect on ROE and decreases by 2.1%. When LNEPU increases by 1%, ROE decreases by approximately 3.43%. When LNWUI increases by 1%, ROE increases by 12.38%. The probability values of the LNCDS, LNEPU and LNWUI variables also show that the results are significant at the 1% level.

5. CONCLUSION

This study provides significant contributions to the limited literature in this field by examining the effects of the increasing economic policy uncertainty after the global financial crisis on the financial sector through the banking sector. The relationship between the EPU index of 25 countries including Turkiye and the NIM, ROA and ROE data of the banking sector was empirically investigated by including the WUI and CDS variables, in line with the guide developed by Baker et al. (2015).

The Westerlund cointegration test results revealed a strong cointegration relationship in all three models. This result confirms that the series affect each other in the long term and that there is a significant relationship between them. The analyses conducted with the MG long-term estimator show that there is no significant relationship between NIM and other explanatory variables; however, there is a significant and negative relationship between the ROA variable and lnEPU and lnCDS. Specifically, a 1% increase in the lnEPU and lnCDS variables leads to a decrease of ROA by 0.49% and 0.25%, respectively. Similarly, a significant and negative relationship was found between the ROE variable and lnEPU and lnCDS at the 1% level; in this case, a 1% increase in lnEPU and lnCDS reduces ROE by 5.09% and 1.84%, respectively.

The findings obtained with the MG estimator were tested with another long-term estimator, FMOLS. The FMOLS estimator results revealed that a 1% increase in lnEPU and lnCDS had a negative effect of 0.77% and 0.41% on NIM, respectively, while there was a positive relationship of 1.49% with the WUI variable. In addition, a 1% increase in lnEPU and lnCDS variables had a negative effect of 0.40% and 0.08% on ROA, while a positive effect of 1.10% was observed in lnWUI. In the ROE variable, when lnEPU and lnCDS increased by 1%, a decrease of 3.43% and 2.1% was observed, respectively, and an increase of 12.38% in the WUI variable was observed. The MG estimator results showed that there was no significant relationship between lnWUI and other variables, while the FMOLS estimator found a positive relationship. This difference may be consistent with the scope of the WUI variable and the findings obtained in some studies (Danisman & Tarazi, 2020; Khan & Umar, 2023). Since WUI (2018) is a relatively new measure, studies examining its relationship with the banking sector are limited; this increases the contribution of our study to the literature.

The findings of this study support the consensus in the general literature on the negative impact of economic policy uncertainty on the profitability of the banking sector. The increasing levels of uncertainty today once again emphasize the importance of this phenomenon and its effects on the profitability of the sector. In light of the findings of our study, it is recommended that more importance be given to economic policy uncertainty and that policy makers take the Economic Policy Uncertainty index into account in their decision-making processes. This has the potential to increase the effectiveness and accuracy of the strategies to be developed.

Future studies can further enrich the knowledge in this area by examining the effects of relatively new variables such as WUI on the banking sector in more depth. In addition, the generalizability of the results obtained can be assessed by conducting research in different regions and sectors.

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